

### REMARKS

Claims 6, 8-12, 14, 16, and 18-22, 33, and 35 have been canceled herein. In addition, claim 37 has been canceled and the limitations therein incorporated into independent claim 24. Applicants note that each of claims 2-5, 25-26, 28-29, and 31 are again properly identified as "Original" claims. Claims 2-5, 25-26, 28-29, and 31 were inadvertently mislabeled as "Previously Presented" in Applicants' prior response of January 12, 2009. Claims 1-5, 24-26, and 28-36 are now pending in this application. Reconsideration of the present application in light of the above amendments and the following remarks and an indication of allowance of the pending claims are respectfully requested.

#### Prior Art Rejections

Claims 1, 3, 5 and 34 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,270,896 to Polinski et al. (Polinski) in view of U.S. Patent No. 3,953,176 to Santala et al. (Santala), U.S. Patent No. 6,667,017 to Murrell et al. (Murrell), U.S. Patent No. 6,040,266 to Fay, III et al. (Fay III), and U.S. Patent No. 5,183,401 to Dalla Betta et al. (Dalla Betta).

Claim 2 was rejected under 35 U.S.C. §103(a) as being unpatentable over Polinski in view of Santala, Murrell, Fay, III, and Dalla Betta as applied to claim 1, and further in view of U.S. Patent No. 5,207,053 to Spadaccini et al. (Spadaccini).

Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over Polinski in view of Santala, Murrell, Fay, III, and Dalla Betta as applied to claim 1 above, and further in view of U.S. Patent No. 5,645,803 to Steenackers et al. (Steenackers).

Claim 32 was rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski, Santala, Murrell, Fay, III, and Dalla Betta as applied to claim 1, and further in view of Butler et al. (RMRS-RP-9).

Claims 6, 9, 16, 18, 20-21 and 35 were rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski in view of U.S. Published Patent Application No. 2002/0076372 to Leloup et al. (Leloup) and Dalla Betta.

Claims 8 and 22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski, Leloup, and Dalla Betta as applied to claim 6, and further in view of Spadaccini.

Claims 10-11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski, Leloup, and Dalla Betta as applied to claim 6, and further in view of U.S. Patent No. 6,667,017 to Murrell et al. (Murrell).

Claim 33 was rejected under 35 U.S.C. §103(a) as being unpatentable over Polinski, Leloup, and Dalla Betta as applied to claim 6 above, and further in view of Butler et al. (RMRS-RP-9).

Claims 24-26, 29, 31, and 36 were rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski in view of Fay, III, Butler et al. (RMRS-RP-9), and U.S. Patent No. 5,228,847 to Lywood (Lywood).

Claim 28 was rejected under 35 U.S.C. §103(a) as being unpatentable over Polinski, Fay, III, Butler et al. (RMRS-RP-9), and Lywood as applied to Claim 24 above, and further in view of Steenackers.

Claim 37 was rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski, Fay, III, Butler et al. (RMRS-RP-9), and Lywood as applied to claim 24 above, and further in view of Leloup.

#### Independent Claim 1

As indicated above, independent claim 1 remains rejected under 35 U.S.C. §103(a) as being unpatentable over Polinski in view of Santala, Murrell, Fay III, and Dalla Betta. For the convenience of the Examiner, independent claim 1 is reprinted in full below:

A catalytic combustor comprising:

a first catalytic stage comprising a metallic catalyst support and receiving an oxidizer and a fuel and discharging a partially oxidized fuel/oxidizer mixture;

a second catalytic stage comprising a ceramic reticulated foam catalyst support disposed within a pressure boundary defining a pressure boundary cross-sectional flow area, the foam catalyst support receiving a first portion of the mixture and presenting a support cross-sectional flow area less than the pressure boundary cross-sectional flow area to define a bypass passageway for allowing a second portion of the mixture to bypass the foam catalytic support, the second catalytic stage having an outlet temperature elevated sufficiently to completely oxidize the mixture without using a separate ignition source;

an oxidation completion stage disposed downstream of the second catalytic stage for recombining the first and second portions of the mixture and completing oxidation of the mixture, and

a transition stage disposed between the first catalytic stage and the second catalytic stage, the transition stage comprising a narrowed flow area region disposed between an inlet end receiving the partially oxidized fuel/oxidizer mixture from the first catalytic stage and an outlet end discharging the partially oxidized fuel/oxidizer mixture into the second catalytic stage, wherein the narrowed flow area region of the transition stage has a narrower flow area than each of the first catalytic stage and the second catalytic stage.

In the March 9, 2009 Office Action, the Examiner admits that "Polinski et al. does not teach a metallic catalyst support for the first catalytic stage and a ceramic reticulated foam catalyst support for the second catalytic stage..." See p. 4 of the March 9, 2008 Office Action. Nevertheless, the Examiner still maintains that Santala fills in the deficiencies of Polinski. Specifically, the Examiner states:

Santala et al. discloses a catalytic converter having two stages made of corrugated metal strips (see Abstract; column 1, line 32 through column 2, line 33; and figure 7) and in an alternate embodiment the catalyst section (12b) are formed with a hollow cylindrical configuration by wrapping the paired corrugated catalyst strip material (32) around a metal tubing (58) (see column 7, line 5 through column 8, line 3 and figure 9)...Therefore, because their two catalytic support materials were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found obvious to substitute metal for ceramic. See p. 4 of the March 9, 2009 Office Action.

Applicants respectfully disagree with the Examiner's position. In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958). (emphasis added). In this case, the prior art, including the cited references, does not recognize "a metallic catalyst support" and "a ceramic reticulated foam catalyst support" as equivalents. In addition, the Examiner's statement on pages 26-27 of the March 29, 2009 Office Action that Polinski and Santala disclose similar catalytic systems, thus the different catalyst supports are recognized as equivalents is an argument based on the functional or mechanical equivalency, which is prohibited as underlined above. In view of the above, the prior art does not recognize "a metallic catalyst support" and "a ceramic reticulated foam catalyst support" as equivalents to support a *prima facie* case of obviousness.

With respect to the combination of Murrell and Polinski, the Examiner contends:

Murrell et al discloses an apparatus for the catalytic oxidation of environmentally harmful compounds (see column 1, lines 7-9) having a monolith honeycomb structure (10), a corrugated structure (12), and a corrugated structure (14) combined with a monolith structure (16) (see column 11, lines 51-65 and figures 3a-c) and that it is known in the art to have catalytic converters including metal-ceramic combustors (see column 2, lines 18-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al. and Santala et al. with the teachings of Murrell et al. such that there is a metallic catalyst support for the first catalytic stage and a ceramic reticulated foam catalyst support for the second catalytic stage in order to further increase the conversion of NO (see Murrell et al., column 11, lines 44-50).

"Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex*, 127 S. Ct. 1727 (2007). (Emphasis added). In reviewing col. 11, lines 44-50 of Murrell, no articulated reasoning is provided that would lead one skilled in the art to modify the structure of Polinski to specifically include "a first catalytic stage comprising a metallic catalyst support..." and "a second catalytic stage comprising a ceramic reticulated foam catalyst support" as claimed. Further, the Examiner has not provided such an articulated reasoning outside of Murrell to explain why one skilled in the art would modify the teachings of Polinski with the teachings of Murrell. Referring again to col. 11, lines 44-50 of Murrell, Murrell states that "[i]t is believed that to further increase the conversion of NO, a combination of corrugated porous MEC mesh material and conventional honeycomb monolith in a vertical flow orientation may be used. This is shown in FIG. 3c. This combination may also be applicable to environmentally harmful compounds as well."

Nothing in col. 11, lines 44-50 of Murrell teaches or suggests that increased conversion of NO would be accomplished by "a first catalytic stage comprising a metallic catalyst support..." and "a second catalytic stage comprising a ceramic reticulated foam catalyst support." Instead, Murrell discloses a combination of porous MEC mesh material and convention honeycomb monolith, which is different from the

claimed invention. Thus, the Examiner has not provided the requisite rational reasoning for modifying the teachings of Polinski with the teachings of Murrell to arrive at the claimed invention. Moreover, modifying the teachings of Polinski with the teachings of Murrell would also not provide "a first catalytic stage comprising a metallic catalyst support..." and "a second catalytic stage comprising a ceramic reticulated foam catalyst support" as claimed.

In view of the above, Applicants respectfully submit that independent claim 1 is in condition for allowance because the modification of Polinski with the teachings of Santala or Murrell as proposed by the Examiner would not produce the invention as claimed in independent claim 1.

Further, dependent claims 2-5, 32, and 34 are dependent on independent claim 1 and thus include the limitations of independent claim 1. For at least the reasons set forth above with respect to independent claim 1, Applicants respectfully submit dependent claims 2-5, 32, and 34 are also in condition for allowance.

#### Independent Claim 24

Applicants have amended independent claim 24 to include the limitations of now canceled dependent claim 37. Claims 24-26, 29, 31, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski in view of Fay, III, Butler et al. (RMRS-RP-9), and U.S. Patent No. 5,228,847 to Lywood (Lywood).

Dependent claim 37 was rejected under 35 U.S.C. §103(a) as being unpatentable over Polinski, Fay, III, Butler et al. (RMRS-RP-9), and Lywood as applied to claim 24, and further in view of Leloup.

Specifically, independent claim 24 now recites:

A catalytic combustor comprising:

- an upstream pressure boundary comprising a catalytic surface disposed therefor receiving a fuel/oxidizer mixture and discharging a partially oxidized fuel/oxidizer mixture;

- a downstream pressure boundary defining a pressure boundary cross-sectional flow area for receiving the partially oxidized fuel/oxidizer mixture; and

- a catalyst-coated reticulated foam support disposed within the downstream pressure boundary for receiving a first portion of the mixture and presenting a support cross-sectional flow area less than the downstream pressure boundary cross-sectional

flow area to define a bypass passageway for allowing a second portion of the fuel/oxidizer mixture to bypass the foam support;

a plurality of additional bypass passageways for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support, wherein said plurality of additional bypass passageways comprises a plurality of spaced apart, tubular passageways extending longitudinally through the foam support;

wherein the bypass passageway is disposed around a portion of an outer perimeter of the reticulated foam support; and

wherein the reticulated foam support comprises a cross-section perimeter smaller than an internal perimeter of the pressure boundary, the foam support supported against the internal perimeter by spaced apart standoffs comprising the reticulated foam support.

With respect to dependent claim 37, the Examiner admits that Polinski does not disclose "a catalytic combustor further comprising a plurality of additional bypass passageways for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support, wherein said plurality of additional bypass passageways comprises a plurality of spaced apart, tubular passageways extending longitudinally through the foam support." See p. 24-25 of the March 9, 2009 Office Action. Nevertheless, the Examiner contends that "Fay, III et al. discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20) and a bypass passageway for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support (see figure 8 and column 8, lines 16-28). Further, the Examiner contends that "Leloup et al discloses that it is known in the art to have a spacing interval or chamber (16) within enclosure (14) between catalysts (12a-b) (see paragraph 0034 and figure 2). The Examiner concludes that "[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al., Fay, III et al., Butler et al., and Lywood with the teachings of Leloup et al. such that a plurality of catalyst supports are spaced apart resulting in a plurality of additional bypass passageways for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support." (emphasis added).

Applicants respectfully disagree with the Examiner's position. The claimed structure of claim 24 cannot be arrived at by simply providing a plurality of spaced apart catalyst supports as contended by the Examiner. Instead, the claimed invention requires that the "plurality of additional bypass passageways comprises a plurality of

spaced apart, tubular passageways extending longitudinally through the foam support." None of the cited references, alone or in combination, teach or suggest a plurality of spaced, apart tubular passageways that specifically extend longitudinally through the individual catalytic element (e.g., catalyst 12a-b of Leloup). Accordingly, Applicants respectfully submit that independent claim 24 as amended is now in condition for allowance.


In addition, dependent claims 25-26, 28-29, 31, and 36 are dependent on Claim 24 and thus include the limitations of independent claim 24. For at least the reasons set forth with respect to independent claim 24, Applicants respectfully submit that dependent claims 25-26, 28-29, 31, and 36 are also in condition for allowance.

Conclusion

Applicants respectfully request reconsideration and allowance of the present application in view of the foregoing arguments.

Respectfully submitted,

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